2018

Cognitive Differences from Preseason to End of Season among Youth and College Football Players

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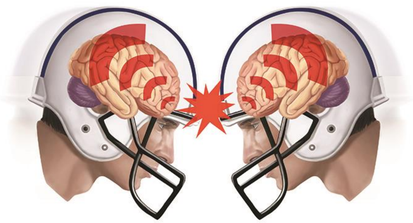
Summary

Coronado et al. (2015) estimated that 329,290 children, aged 19 years and younger, were treated for sports and recreation injuries, including concussion, in emergency rooms during 2012. Further, they found that the number of concussions within this age group doubled since 2001. Many states now have laws regarding concussion education and testing for youth to high school level sports. While diagnosed concussions are important to evaluate, contact below the level necessary for concussion seems to accumulate over the course of a season (e.g., Abbas et al., 2015). This study examined sub-concussive hits and changes in neurocognitive assessment within a single season. The ImPACT test is a commonly used baseline and post-injury neurocognitive assessment for concussion. It includes composite scores for verbal memory, visual memory, visual motor speed, reaction time, and impulse control as well as an efficiency index score that compares speed of responding and accuracy. This test was given to college and youth football players during the preseason prior to the start of practices. One week after the season ended, players who did not receive a concussion during the season were asked to complete an end-of-season test. Approximately 33 and 52 percent of the DIII college and middle school football players, respectively, completed the end-of-season test. A series of 2x2 ANOVAs were conducted to look at differences on the ImPACT composite scores from preseason to end-of-season for youth and college football players. Overall, the results suggest that there are no meaningful differences in the cognitive domains examined by the ImPACT test over the course of a football season regardless of age. However, using rs-fMRI, Slobounov et al. (2017) found significant differences in the cingulate cortex and hippocampus among FBS football players within a single season. These differences were observed in the absence of clinical symptoms or a diagnosed concussion. Therefore, it appears that behavioral symptoms and neurocognitive assessments are not sensitive enough to detect the pathophysiological changes that take place in the brain due to sub-concussive hits absorbed over the course of a football season.



Introduction

Preventing sport-related concussions has received considerable attention over the last several years. While the majority of the focus has been placed on football, the potential for concussion exists in almost any sport (or activity) and at any level. Coronado et al. (2015) estimated that 329,290 children, aged 19 years and younger, were treated for sports and recreation injuries, including concussion, in emergency rooms during 2012. Further, they found that the number of concussions within this age group doubled since 2001. Many states now have laws regarding concussion education and testing for youth to high school level sports. While diagnosed concussions are important to evaluate, contact below the threshold necessary for concussion seems to accumulate over the course of a season (e.g., Abbas et al., 2015). In this study, we examined sub-concussive hits and changes in neurocognitive assessment within a single season for both college and youth football players.

Method

Participants

Forty-eight college football players and 95 youth football players are baseline tested before the start of the season. Approximately 33 and 52 percent of the DIII college and middle school football players, respectively, completed the end-of-season test.

Instrument

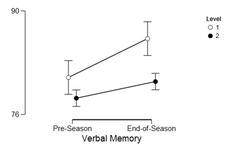
The ImPACT test is a commonly used baseline and post-injury neurocognitive assessment for concussion. It includes composite scores for verbal memory, visual memory, visual motor speed, reaction time, and impulse control as well as an efficiency index score that compares speed of responding and accuracy.

Procedure

This test was given to college and youth football players during the preseason prior to the start of practices. One week after the season ended, players who did not receive a concussion during the season were asked to complete an end-of-season test.

Results and Discussion

A series of 2x2 ANOVAs were conducted to look at differences on the ImPACT composite scores from preseason to end-of-season for youth and college football players. There were no significant interactions between the time of test and level of play for any composite score domain. There was a significant difference between pre- and post-season scores for verbal memory ($F(1, 63) = 5.13$, $p < .03$; $\eta^2 = .07$). Marginally significant differences were found for visual motor speed ($F(1, 63) = 2.69$, $p < .09$; $\eta^2 = .05$) and the efficiency index ($F(1, 63) = 3.42$, $p < .07$; $\eta^2 = .05$). For each of these composite scores, however, the effect sizes were small and the scores were slightly better at the end of the season than at the start of the season. No other differences were found.



Overall, the results suggest that there are no meaningful differences in the cognitive domains examined by the ImPACT test over the course of a football season regardless of age. This finding is potentially encouraging. However, using rs-fMRI, Slobounov et al. (2017) found significant differences in the cingulate cortex and hippocampus among FBS football players within a single season. These differences were observed in the absence of clinical symptoms or a diagnosed concussion. Therefore, it appears that behavioral symptoms and neurocognitive assessments are not sensitive enough to detect the pathophysiological changes that take place in the brain due to sub-concussive hits absorbed over the course of a football season. If this is true, then we must reconsider how we are testing for sport-related concussion and implement a battery of assessment tools that provide the sensitivity necessary to detect changes that are not easily observed with the ImPACT or other common measures (e.g., SCAT-4) currently used to evaluate concussion..

Poster presented at the 126th Annual Convention of the American Psychological Association (San Francisco, 2018)